REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Election/Restriction

Since the Examiner's previous restriction requirement has been made final, applicants have cancelled the non-elected method claims, claims 17-20.

Rejection under 35 USC §§ 102 and 103

Claims 1 and 4 stand rejected under 35 USC § 102(e) as being anticipated by Lur et al. U.S. Patent Publication No. US 2004/0097065 A1. Claims 1-3 and 7-16 stand rejected under 35 USC § 102(e) as being anticipated by Goldberg et al. U.S. Patent No. 6,838,354.

Claims 4-6 stand rejected under 35 USC § 103 as being obvious from Goldberg et al. in view of the Examiner's statements on pages 9 and 10 of the Office Action.

Applicants respectfully traverse these rejections.

Prior Invention

The only two references cited against the instant application are Lur et al. U.S. Patent Publication No. US 2004/0097065 A1, which was filed on November 15, 2002 and Goldberg et al. U.S. Patent No. 6,838,354, which was filed on December 20, 2002.

Applicants enclose a declaration by the inventors, Robert M. Geffken and William T. Motsiff, under 37 CFR § 1.131 to swear behind the reference dates of Lur et al. and Goldberg et al. The declaration and attached exhibits establish facts showing

conception of this invention in this country prior to the November 15, 2002, and due diligence from a time prior to that date until the application was filed and constructively reduced to practice on September 30, 2003.

The declaration submitted by the inventors establishes that each and every limitation of claim 1 of the above-referenced application is disclosed in the Disclosure attached as Exhibit A, First Embodiment drawings attached as Exhibit B, and Second Embodiment drawings attached as Exhibit C, created prior to November 15, 2002, but redacted to protect confidential information. A comparison of the limitations of claim 1 and the attached Disclosure and First and Second Embodiments of Exhibits A, B and C is as follows:

CLAIM 1	**DISCLOSURE**
A semiconductor device comprising:	"Adjustable, Self Aligned Airgap Dielectric for Low Capacitance Wiring." Disclosure, page 1. "Self Aligned Airgap Insulator with Adjustable height." First and Second Embodiments, page 1.
a first interconnect adjacent a second interconnect on an interconnect level;	"Standard Barrier-Seed layer and Cu deposition processes are used to fill the dual damascene structure ... ." Disclosure, page 3. "Liner/Seed layer, Cu Deposition." First and Second Embodiments, page 6 (upper drawing). Spaced, adjacent first and second interconnects on the same interconnect level. First and Second Embodiments, page 6 (lower drawing) and page 7 (both drawings).

spacers formed along adjacent sides of the first and second interconnects; and	"[C]onformal deposition of a second insulator eg SiO2 or Si3N4 is applied to the existing structure. A second spacer etch is now done and the bottom capping layer is also opened. Disclosure, page 3. "Conformal Insulator Deposition eg. SiO2" and "Oxide Spacer Etch & Cap Open." First and Second Embodiments, page 5. Spacers shown along adjacent sides of the first and second interconnects. First and Second Embodiments, pages 6 and 7.
an air gap formed between the first and second interconnects, the air gap extending above an upper surface of at least one of the first and second interconnects and below a lower surface of at least one of the first and second interconnects, distance between the spacers defining the width of the air gap.	"A resist blockmask is used to expose only those areas which will receive the airgap. The SiC, SiCOH, SiC exposed layers are degrades by exposure to oxygen plasma followed by dilute HF etch which creates a space with an overhang between unmasked minimum space lines. Nitride cap layer and FSG conformal deposition processes are now done which close the airgap layer." Disclosure, page 3. "Etch SiC HM1, Extract Low k & Etch SiC in Min. Space Areas" and "Conformal Insulator Deposition – Nitride Cap & FSG to form Airgap." Air gap shown as formed between the first and second interconnects, with the air gap extending above the upper surface of both interconnects and below the lower surface of the left interconnect, and with the air gap width defined by the distance between the spacers. First and Second Embodiments, page 7.

Accordingly, the inventors' declaration and attached exhibits establish conception of the invention described and claimed in the above referenced application prior to November 15, 2002.

Due diligence from a time before the date of the Lur et al. reference, November 15, 2002, until the constructive reduction to practice of the invention, its September

30, 2003 filing date, is also established by the inventors' declaration. The activities establishing such diligence stated in this declaration were as follows:

1. The Disclosure and First and Second Embodiments of Exhibits A, B and C were submitted for internal review by the invention disclosure team and patent agents and attorneys at IBM prior to November 15, 2002.

2. On December 3, 2002, Mr. Motsiff provided to Anthony Canale, the IBM patent agent responsible for the subject patent application, additional information concerning the disclosure of the subject invention.

3. Subsequently, the subject invention as disclosed in the Disclosure and First and Second Embodiments of Exhibits A, B and C, as well as the additional information provided on December 3, 2002 was reviewed by Anthony Canale, and a decision was made to file a patent application on the invention.

4. On April 14, 2003, the Disclosure and First and Second Embodiments of Exhibits A, B and C, as well as the additional information provided on December 3, 2002 was sent to Attorney Peter Peterson of DeLio & Peterson LLC, New Haven, Connecticut, the outside counsel who was responsible for preparing the application.

5. On June 30 and July 7, 2003, Mr. Motsiff received drafts of the subject patent application for the claimed invention by facsimile from Atty. Peterson, including informal drawings and a partial set of claims. Mr. Geffken at that time was retired from IBM, so that there was some delay in communication between the inventors concerning the draft application. Also, at the time of late June to early July, 2003, Mr. Motsiff was away from his office at IBM.

6. On July 21, 2003, Mr. Motsiff emailed to Atty. Peterson a communication that acknowledged receipt of the fax copy of the draft patent application and requested an electronic (soft) copy of the application for annotation.

7. On August 11, 2003, Mr. Motsiff faxed to Atty. Peterson revisions to the draft patent application, including revisions to the specification and drawings.

8. On August 19, 2003, Mr. Motsiff emailed to Atty. Peterson revisions to the claims of the draft application.

9. On August 21, 2003, Mr. Motsiff received by fax from Atty. Peterson a revised draft of the subject application.

10. On September 2, 2003, Mr. Motsiff received by fax from Atty. Peterson revised informal drawings for the subject application. Subsequently, the inventors reviewed the revised application and drawings, and communicated to Atty. Peterson that the subject application was ready for filing.

11. On or about September 3, 2003, Mr. Peterson ordered formal drawings for the subject patent application, and those drawings were sent to IBM on or about September 25, 2003.

12. On September 29, 2003, the inventors reviewed the final version of the subject patent application and executed the declaration for the application.

13. On September 30, 2003, the subject application was filed with the U.S. Patent and Trademark Office.

The continuous activity between November 15, 2002 and September 30, 2003 by the inventors, the inventors' assignee and the agent and attorney working on the patent application clearly constitutes "due diligence" from a time just prior to the Lur et

al. reference date to the constructive reduction to practice of the invention at the time of filing with the USPTO. 37 CFR § 1.131.

Since the only references cited against the instant application, the Lur et al. patent publication and the Goldberg patent, have been antedated by the enclosed declaration and supporting evidence under 37 CFR § 1.131, it is respectfully submitted that the claims of the application are allowable.

Claim 4

Notwithstanding the evidence of prior invention and diligence, claim 4 is not anticipated by or obvious from the Goldberg et al. patent. Claim 4 recites that, beneath at least one of the first and second interconnects, an etch stop layer is positioned over an underlying via insulator level, and that the air gap extends below the lower surface of the at least one of the first and second interconnects by a distance corresponding to a thickness of the etch stop layer.

The Examiner has taken the position that Goldberg et al. disclose that the air gap can be formed to extend to various depths within the multiple interconnect level, and that therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made that the etch process can be controlled "just through the etch stop layer in order to obtain an optimum isolation or reduction of capacitance coupling of the interconnects within the dielectric layer." Office Acton, pages 9-10.

Despite the Examiner's contention, Goldberg et al. do not disclose or suggest any such limitation on etching to achieve an air gap that extends below the lower surface of an interconnect by a distance corresponding to a thickness of the etch stop layer beneath it. Moreover, there is no motivation disclosed in Goldberg et al. to do so. If the Examiner continues to believe that the limitation of claim 4 is obvious as

stated, the applicants respectfully request that prior art be cited, or an affidavit entered into the record.

Claims 7 and 11

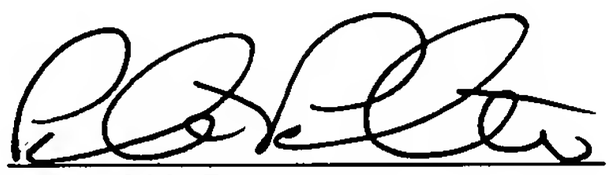
Claim 11 recites that the device includes hardmask spacers self-aligned to either side of an upper portion of the air gap, and the air gap extends between the hardmask spacers and upward into an insulative layer above the interconnect level. Claim 7 recites that hardmask spacers are self-aligned to either side of an upper portion of the air gap, and has been amended to recite that the air gap extends between and below the hardmask spacers. The amendment to claim 7 is supported by the specification in paragraph 0014 and in the drawings at Fig. 11, air gap 68 and hardmask spacers 48b, 48c. No new matter has been added. The purpose of such spacers, as disclosed in the specification at paragraph 0026 and in the drawings in Figs. 10 and 11, is to permit the formation of the air gap without filing it when the subsequent overlying layers are formed.

The Examiner has taken the position that Goldberg discloses such hardmask spacers and air gap extension between the spacers in Figs. 5, 7 and 8 and in the specification at column 4, lines 15-63, column 10, lines 9-44 and column 15, lines 8-28. However, Goldberg et al. do not disclose or suggest such structure. In view of applicants' unique purpose of such hardmask spacers which permit the air gap to be constructed to extend above the spacers, which is not disclosed or suggested by Goldberg et al., the subject matter of claims 7 and 11 is not obvious therefrom.

Accordingly, applicants submit that claims 4, 7 and 11 are not obvious from the cited prior art.

It is respectfully submitted that the application has now been brought into a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,



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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date indicated below as first class mail in an envelope addressed to the Mail Stop _____, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 2231301450.

Name: Barbara Browne Date: July 28, 2005 Signature: 

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